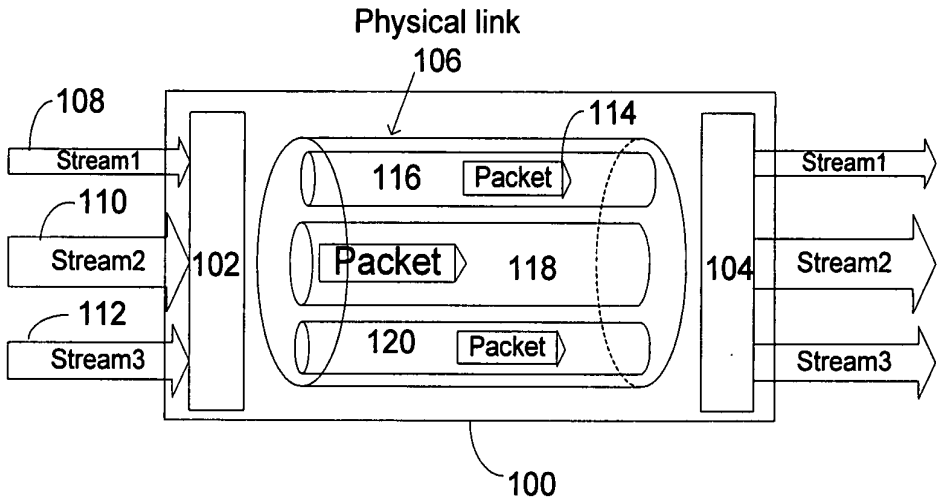
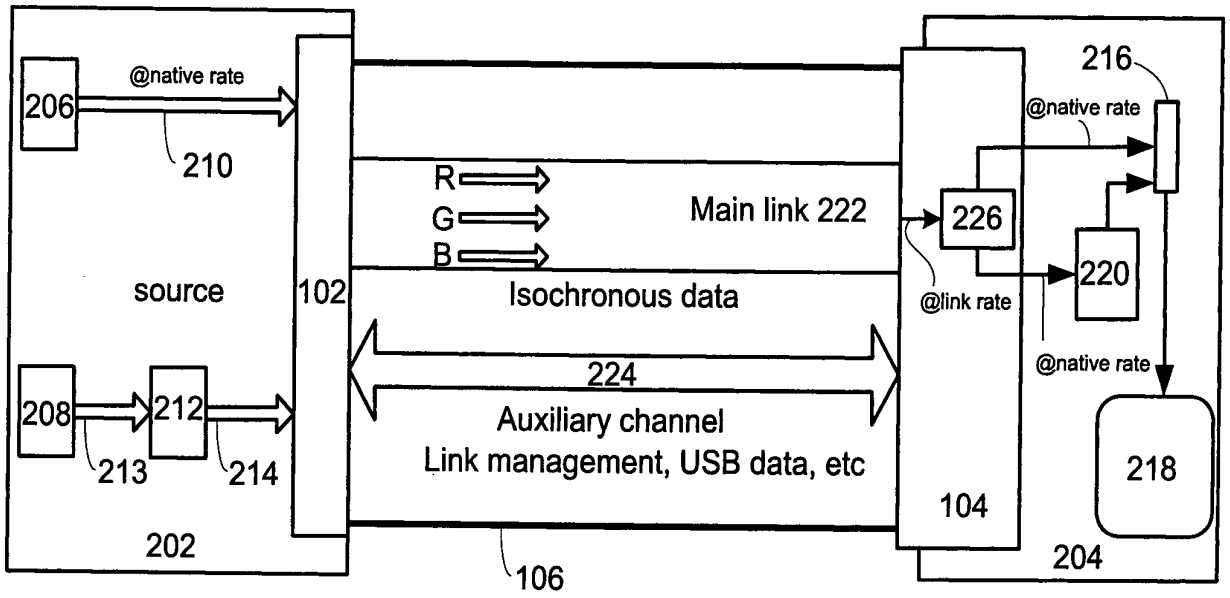
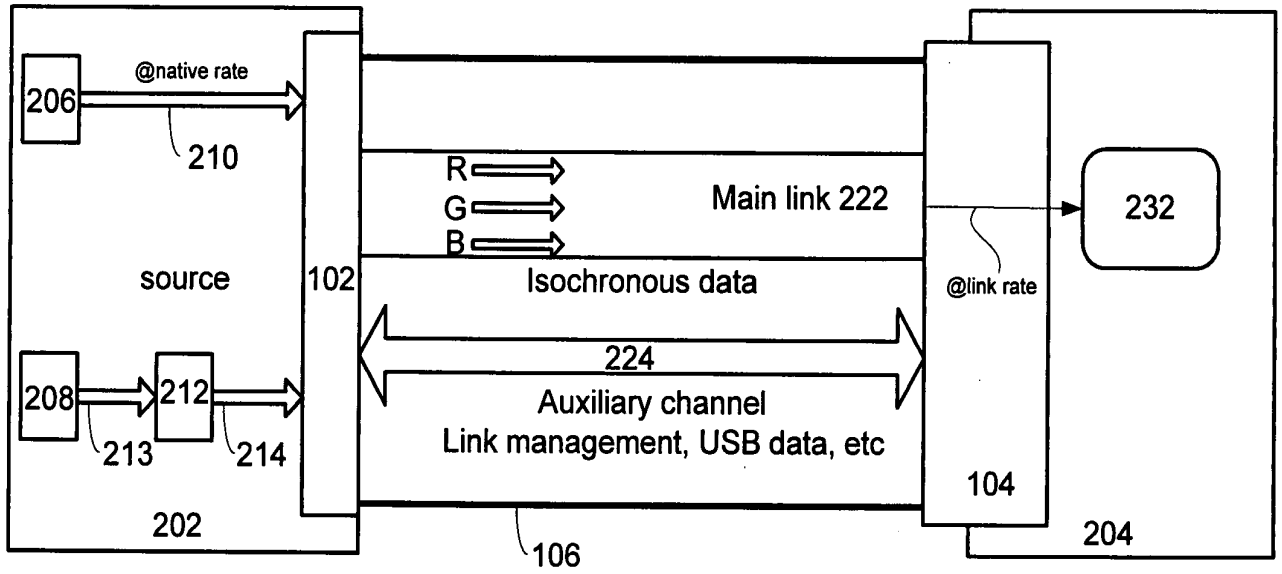

Physical link
106
108
Stream1
110
Stream2
112
Stream3
102
114
116
Packet
Packet
118
120
Packet
104
Stream1
Stream2
Stream3
100

Fig. 1


@native rate
206
210
source
208
212
213
214
202
102
R
G
B
Main link 222
Isochronous data
224
Auxiliary channel
Link management, USB data, etc
106
216
@native rate
226
@link rate
220
@native rate
218
104
204

200

Fig. 2A


@native rate
206
210
R
G
B
Main link 222
232
source
102
Isochronous data
@link rate
224
208
212
213
214
Auxiliary channel
Link management, USB data, etc
104
202
106
204

230

Fig. 2B

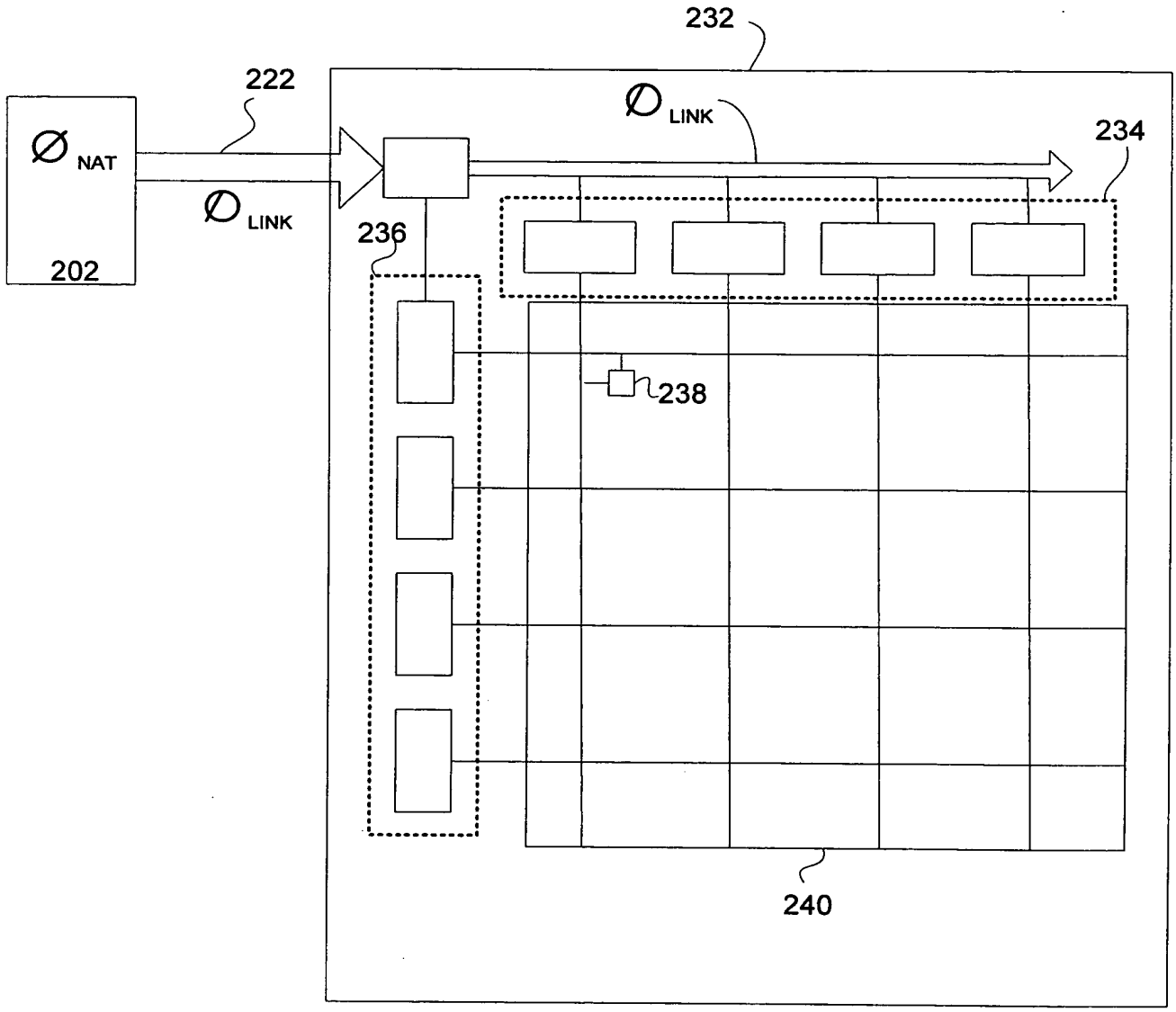


Fig. 2C

Main Link Data Rates

Nominal Baud Rate per channel (Gbits/second)	Actual Baud Rate per channel (Gbits/second)	Clock Multiplication Factor from 24-MHz crystal
1.0	0.960	x40
1.35	1.344	x56
1.7	1.728	x72
2.1	2.112	x88
2.5	2.496	x104

Fig. 3

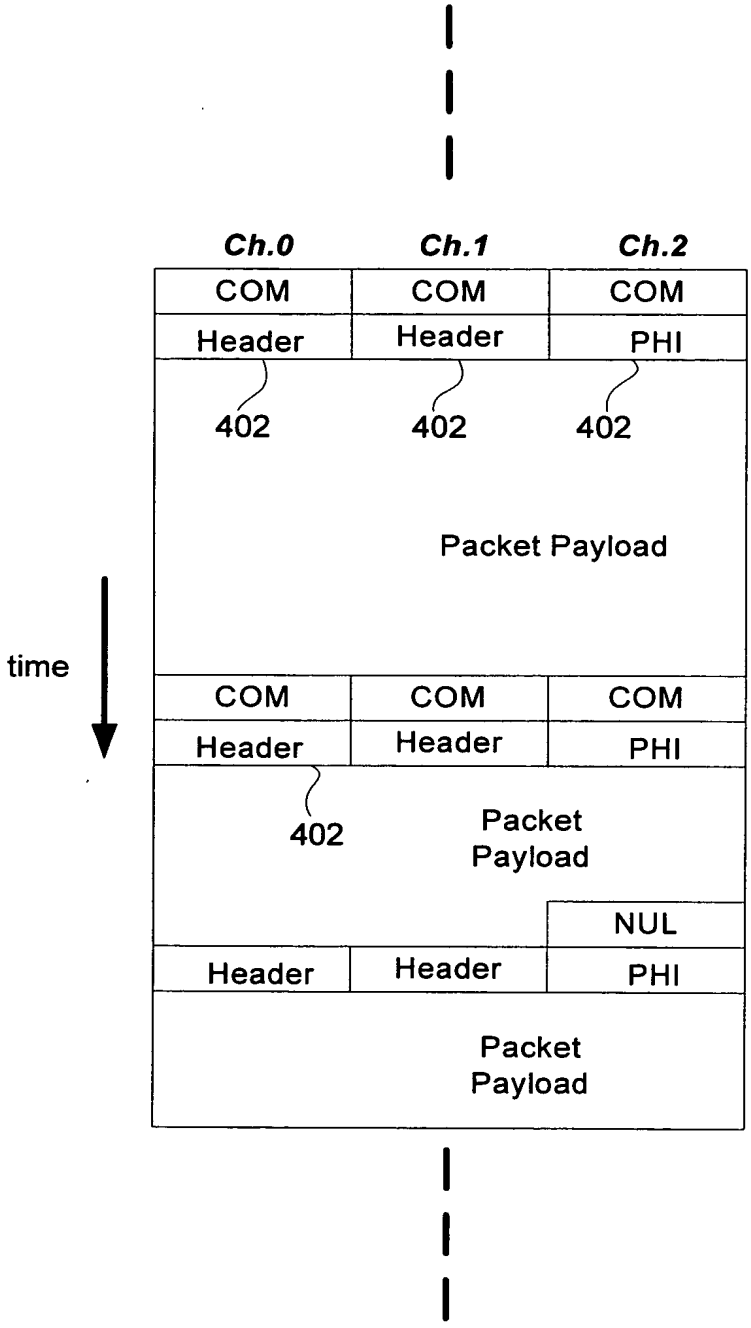


Fig. 4A

Main Link Packet Format

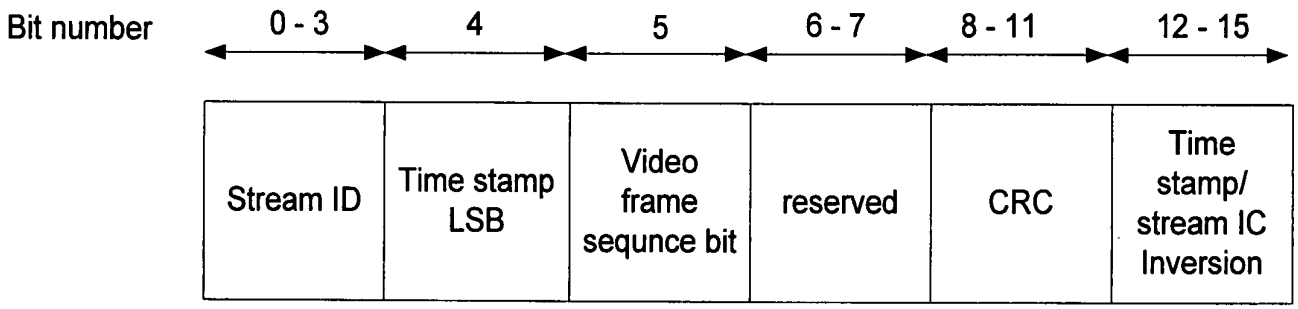
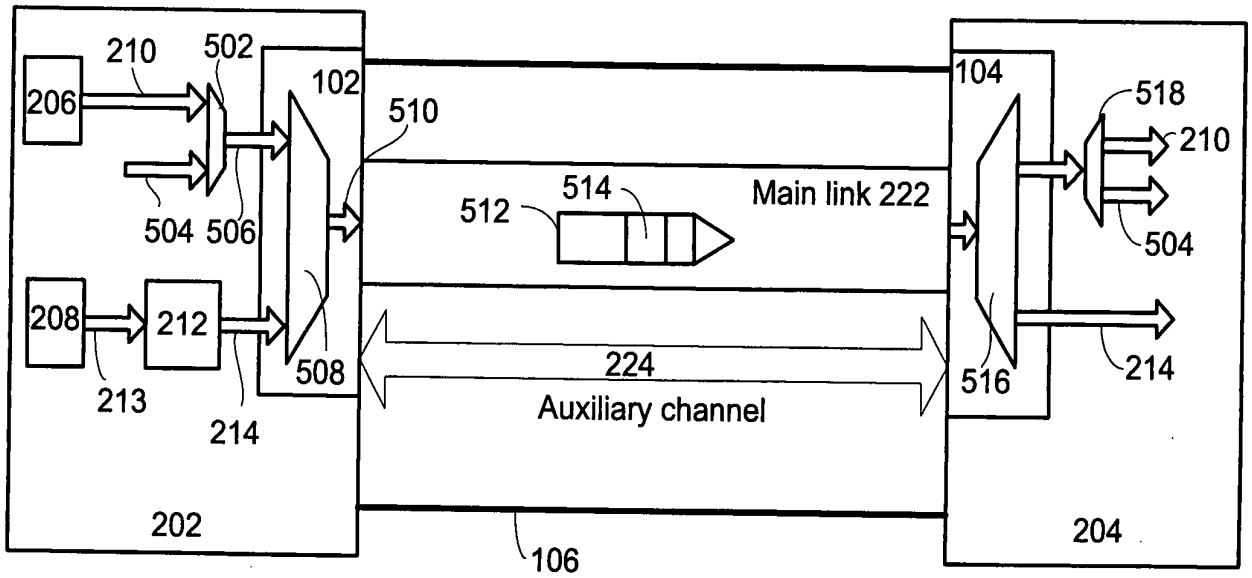
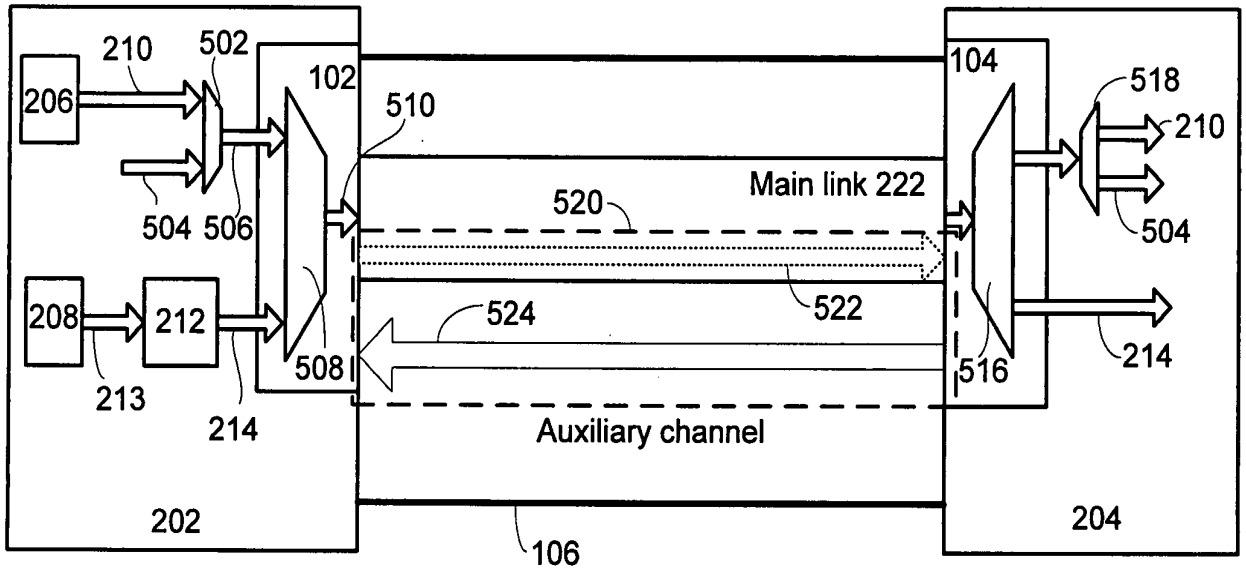

Bit number
0 - 3
4
5
6 - 7
8 - 11
12 - 15
Stream ID
Time stamp LSB
Video frame sequnce bit
reserved
CRC
Time stamp/ stream IC Inversion

Fig. 4B


210
502
206
102
510
104
518
210
504 506
512
514
Main link 222
504
208
212
224
214
508
516
213
214
Auxiliary channel
202
106
204

500

Fig. 5A


210
502
206
102
510
104
518
210
Main link 222
520
504 506
504
208
212
522
524
508
516
214
213
214
Auxiliary channel
202
204
106

500

Fig. 5B

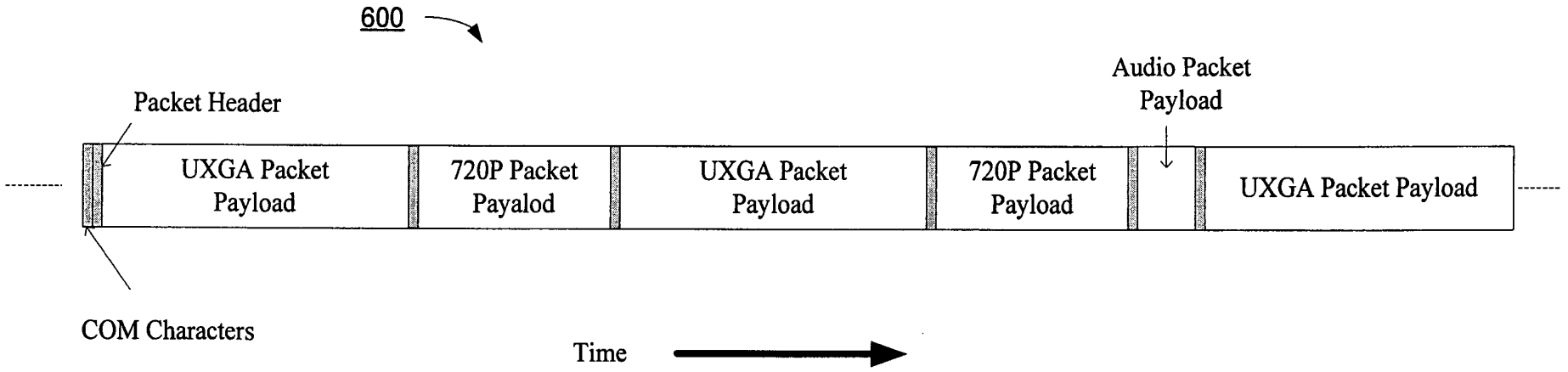


Fig. 6

High-level diagram of link traffic example with three streams

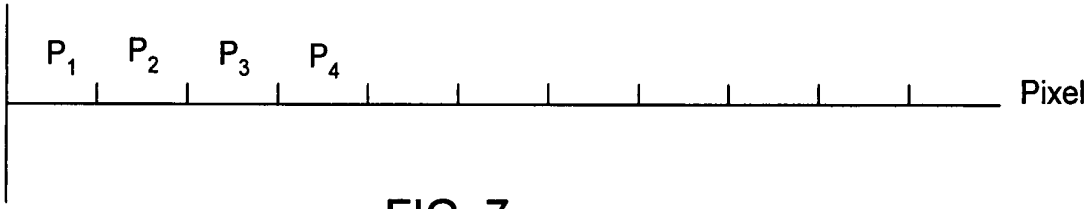
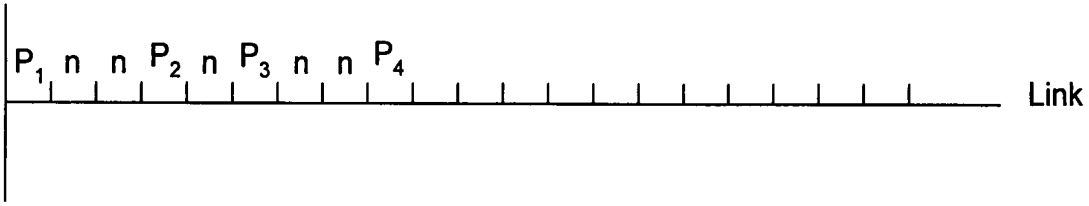


FIG. 7



n = null

FIG. 8

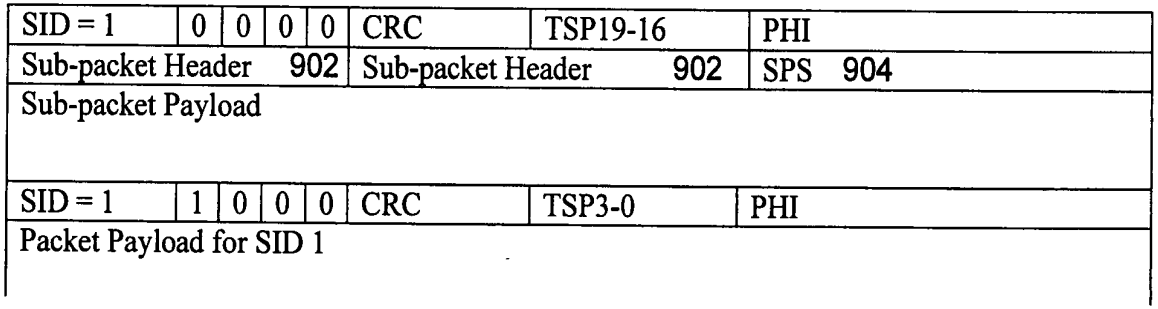

SID = 1
0
0
0
0
CRC
TSP19-16
PHI
Sub-packet Header 902
Sub-packet Header 902
SPS 904
Sub-packet Payload
SID = 1
1
0
0
0
CRC
TSP3-0
PHI
Packet Payload for SID 1

Fig. 9A

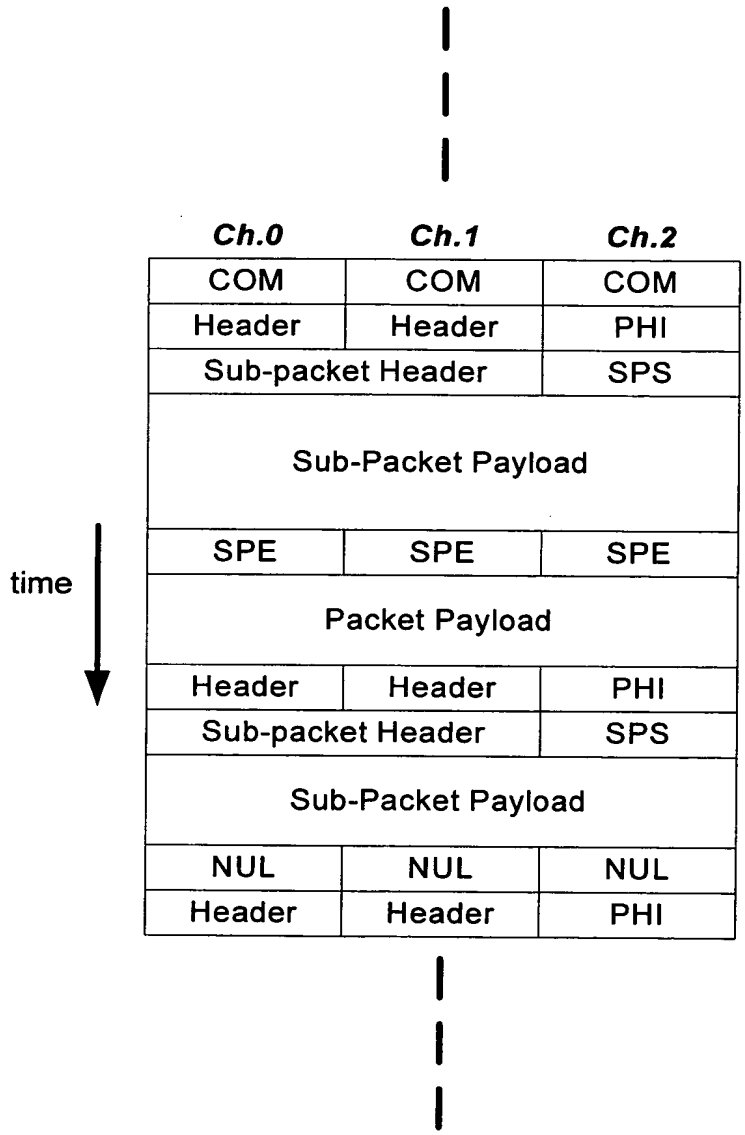

Ch.0
Ch.1
Ch.2
COM
COM
COM
Header
Header
PHI
Sub-packet Header
SPS
Sub-Packet Payload
SPE
SPE
SPE
Packet Payload
Header
Header
PHI
Sub-packet Header
SPS
Sub-Packet Payload
NUL
NUL
NUL
Header
Header
PHI
time

Fig. 9B

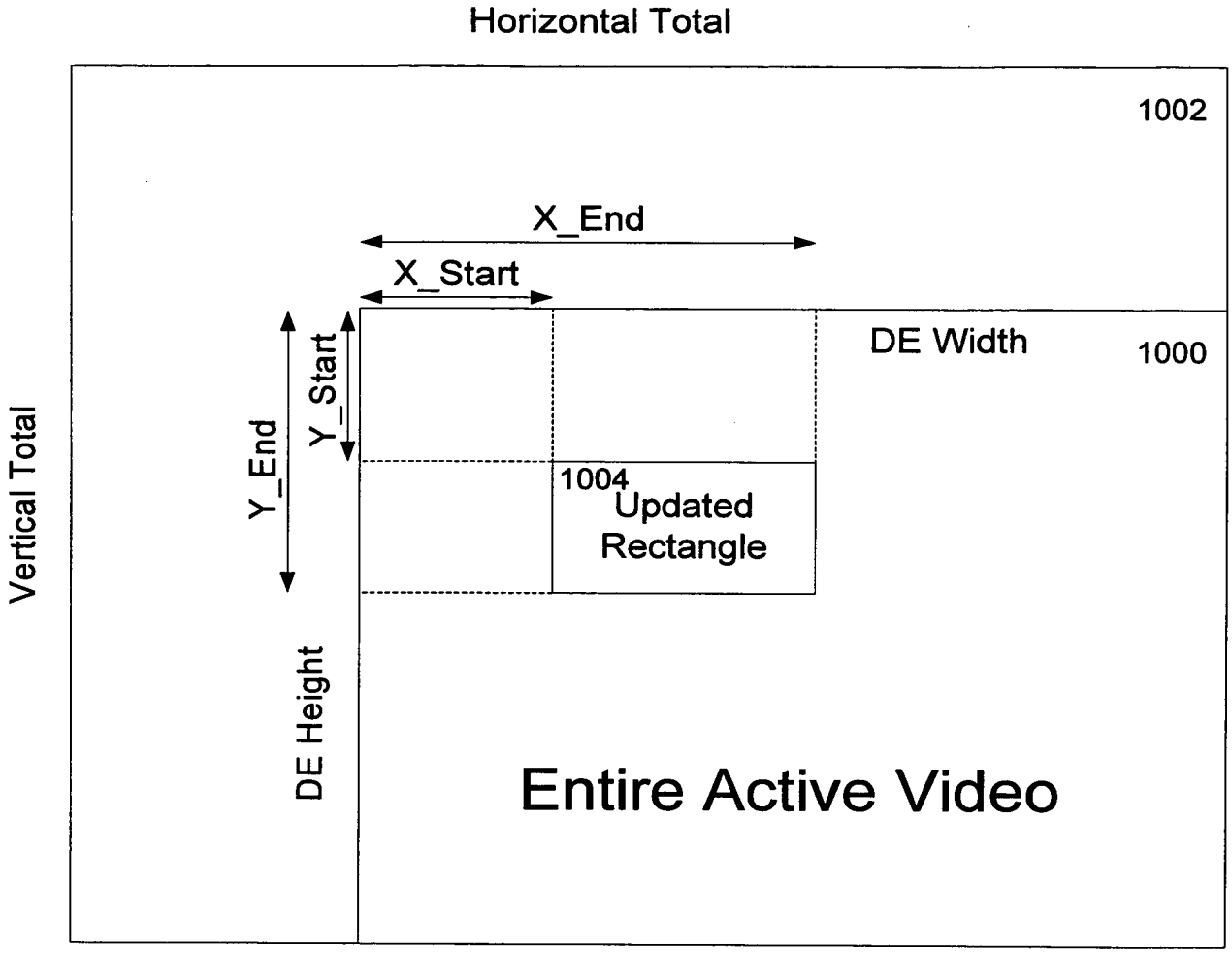

Horizontal Total
1002
X_End
X_Start
DE Width
1000
Y_Start
Y_End
1004
Updated
Rectangle
Vertical Total
DE Height
Entire Active Video

Fig. 10

Phase	Transmitted Link Characters	Binary pattern
1	D10.2	0101010101 0101010101 0101010101 0101010101 0101010101
2	K28.7	0011111000 0011111000 0011111000 0011111000 0011111000
3	K28.5, and three D10.2	0011111010 0101010101 0101010101 0101010101 1100000101

Main Link Training Pattern

Fig. 11

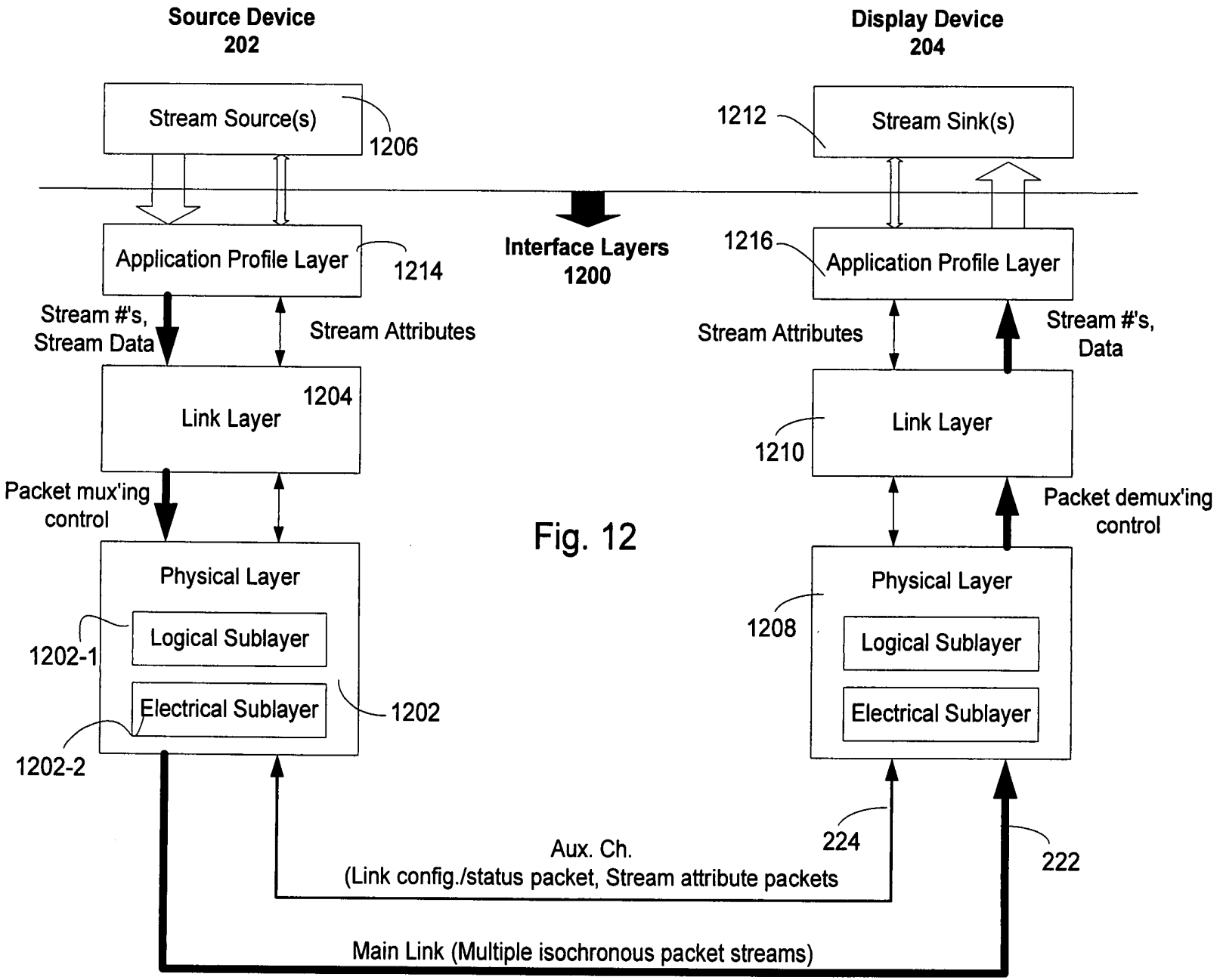
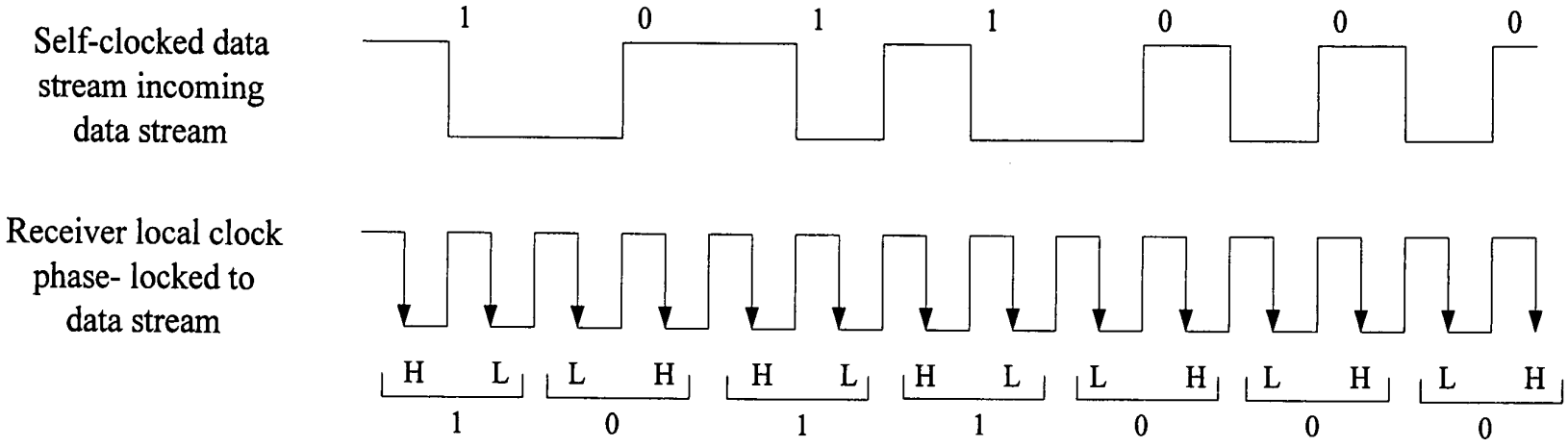

Source Device
202
Display Device
204
Stream Source(s)
1206
1212
Stream Sink(s)
Application Profile Layer
1214
Interface Layers
1200
1216
Application Profile Layer
Stream #'s,
Stream Data
Stream Attributes
Stream Attributes
Stream #'s,
Data
1204
Link Layer
1210
Link Layer
Packet mux'ing
control
Packet demux'ing
control
Physical Layer
1208
Physical Layer
1202-1
Logical Sublayer
Logical Sublayer
Electrical Sublayer
Electrical Sublayer
1202
1202-2
224
222
Aux. Ch.
(Link config./status packet, Stream attribute packets
Main Link (Multiple isochronous packet streams)

Fig. 12

8B/10B Special Characters Usage

Encoding	Name	Description
K28.5	Comma (COM)	Inserted between packets. Also used as part of Test Pattern
K28.7	TrainingPattern (TPN)	Sent during Training Pattern transmission for bit/byte clock lock.
K23.7	Null (NUL)	Sent within the packet period when there is no data to transmit.
K28.2	Sub-packet Start (SPS)	Indicate a start of sub-packet inserted in a packet
K29.7	Sub-packet End (SPE)	Indicate an end of sub-packet inserted in a main packet.
K28.0	PacketHeaderIndicator (PHI)	Sent along with 16 bits of header for header identification.
K28.1		Reserved
K28.3		Reserved
K28.4		Reserved
K28.6		Reserved
K25.7		Reserved
K27.7		Reserved

Fig. 13



A Manchester II-Coded Stream

Fig. 14

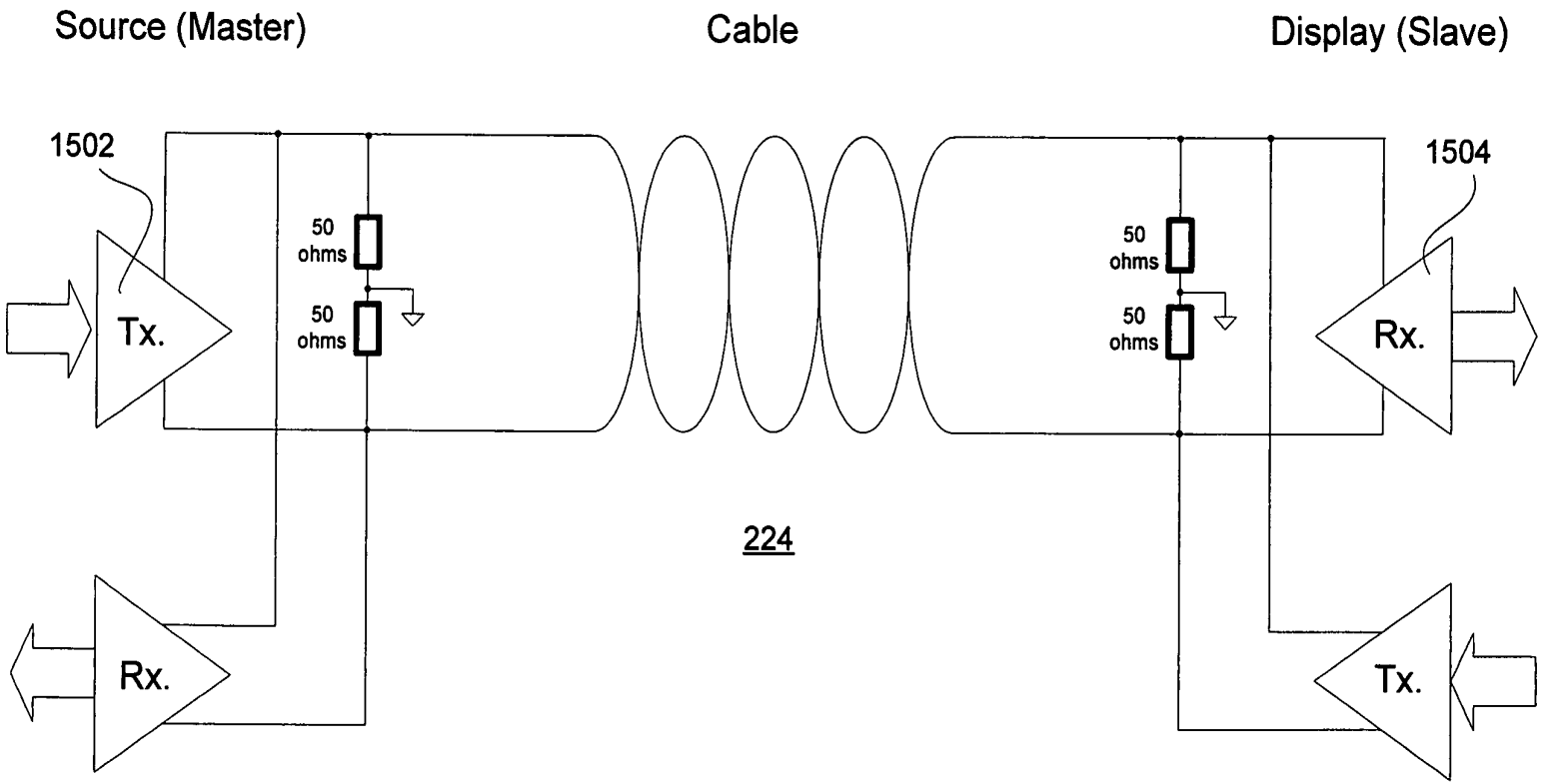
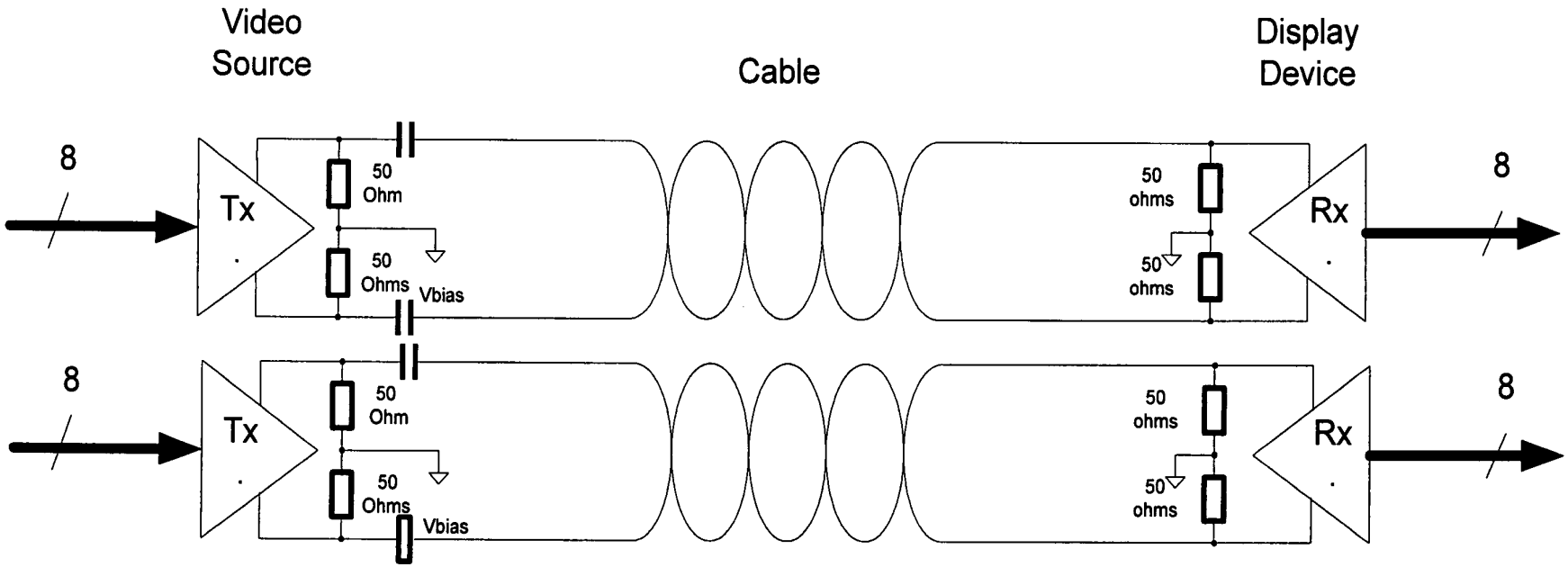

Source (Master)
Cable
Display (Slave)
1502
1504
50 ohms
50 ohms
50 ohms
50 ohms
Tx.
Rx.
Rx.
Tx.
224

Fig. 15


Video
Source
Cable
Display
Device
8
Tx
50
Ohm
50
Ohms
Vbias
50
ohms
50
ohms
Rx
8
8
Tx
50
Ohm
50
Ohms
Vbias
50
ohms
50
ohms
Rx
8

222

Fig. 16

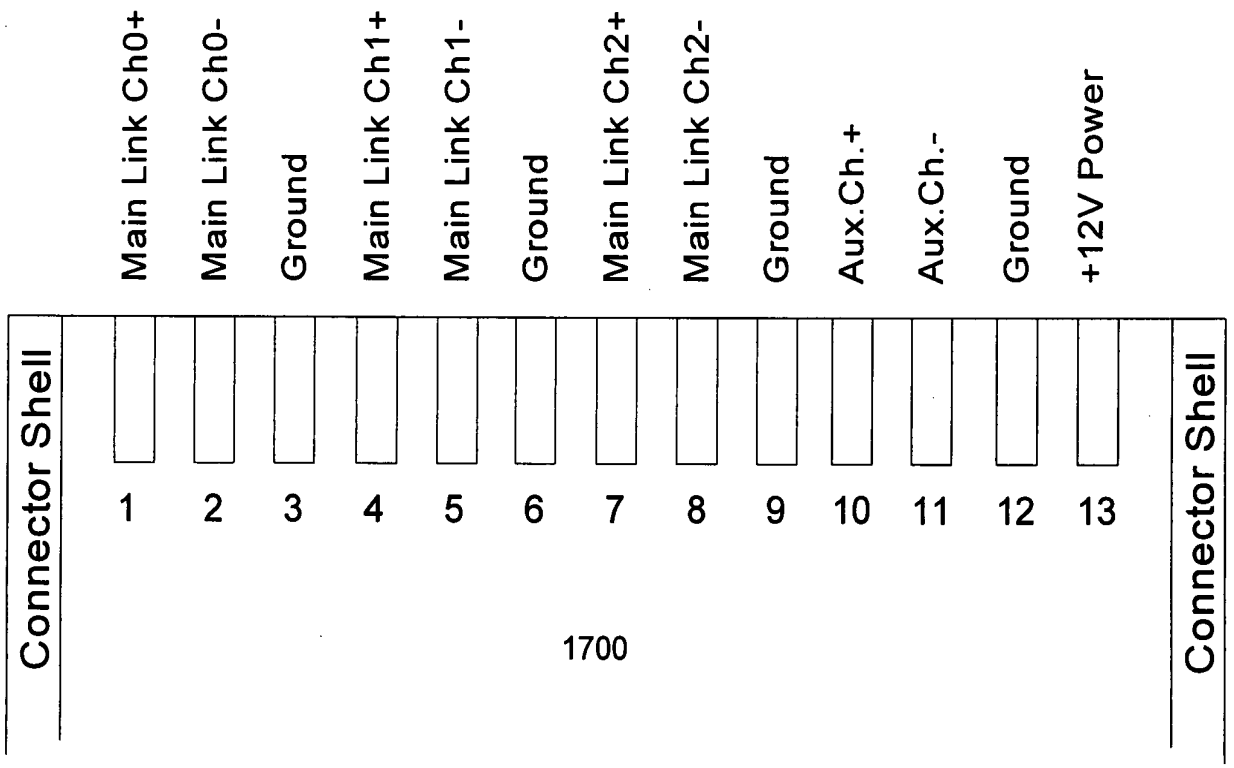
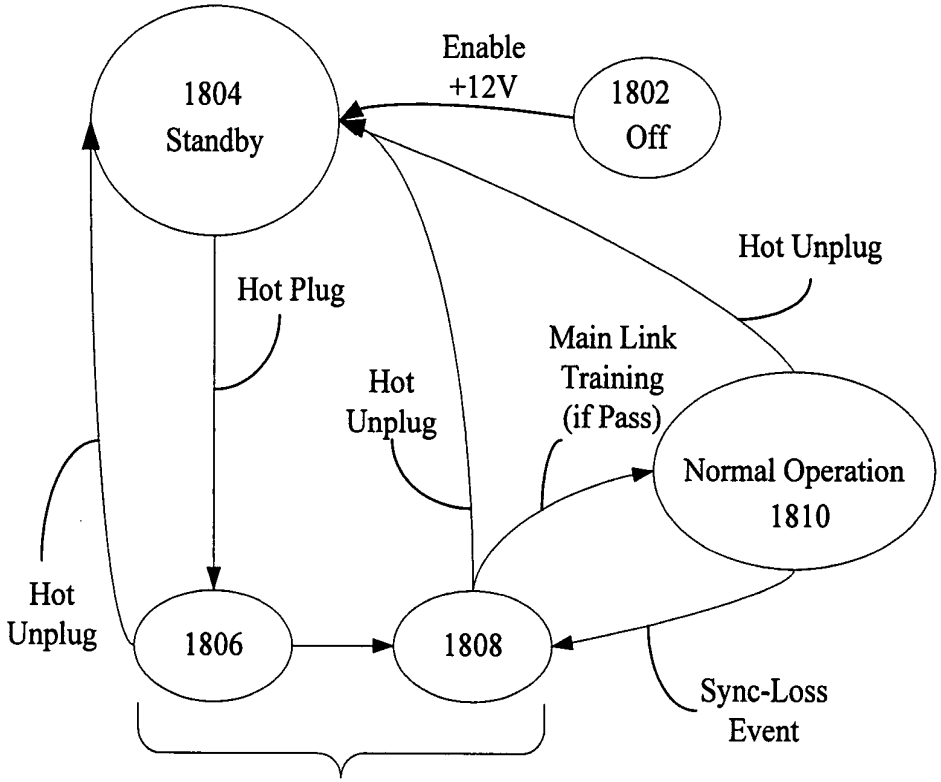

Main Link Ch0+
Main Link Ch0-
Ground
Main Link Ch1+
Main Link Ch1-
Ground
Main Link Ch2+
Main Link Ch2-
Ground
Aux.Ch.+
Aux.Ch.-
Ground
+12V Power
Connector Shell
Connector Shell
1
2
3
4
5
6
7
8
9
10
11
12
13
1700

Fig. 17



1806/1808 - Link Discovery/Initialization

Fig. 18

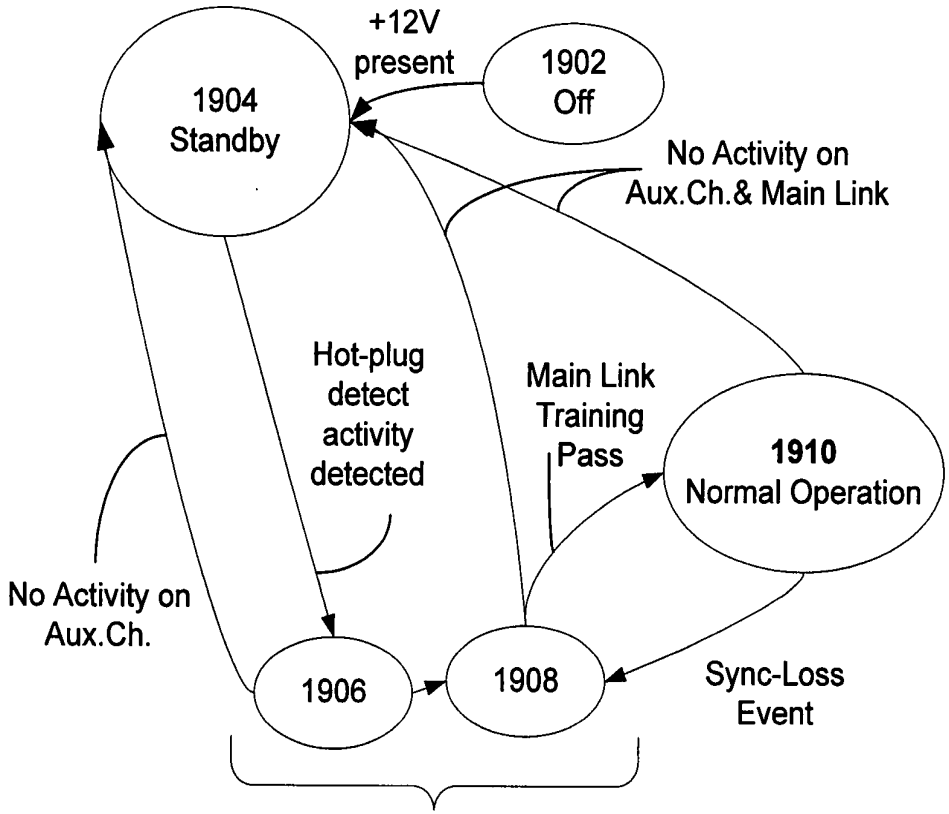
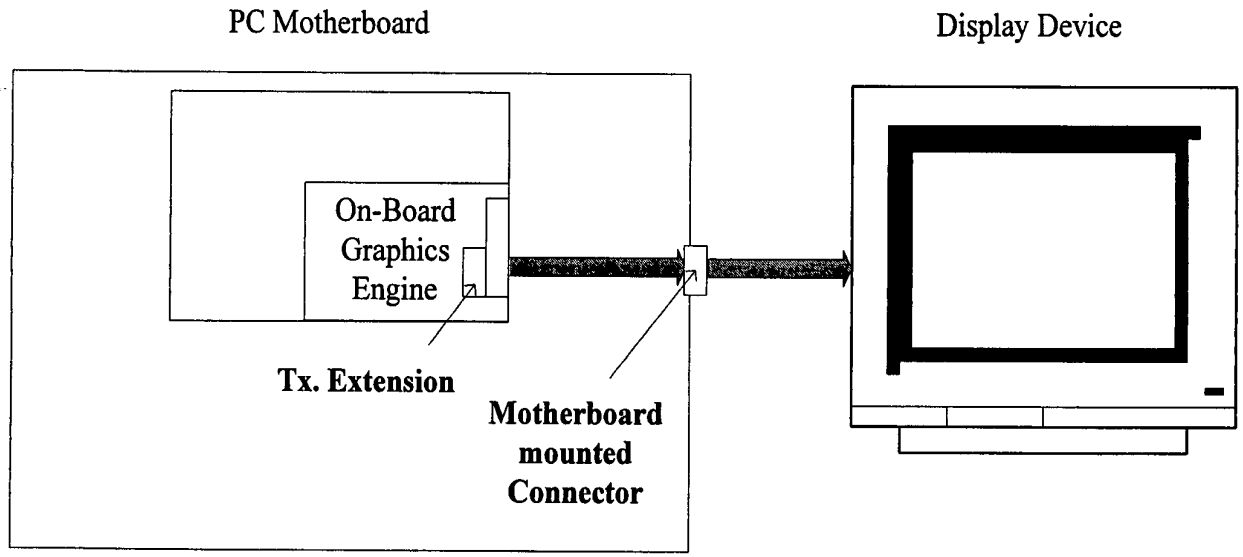
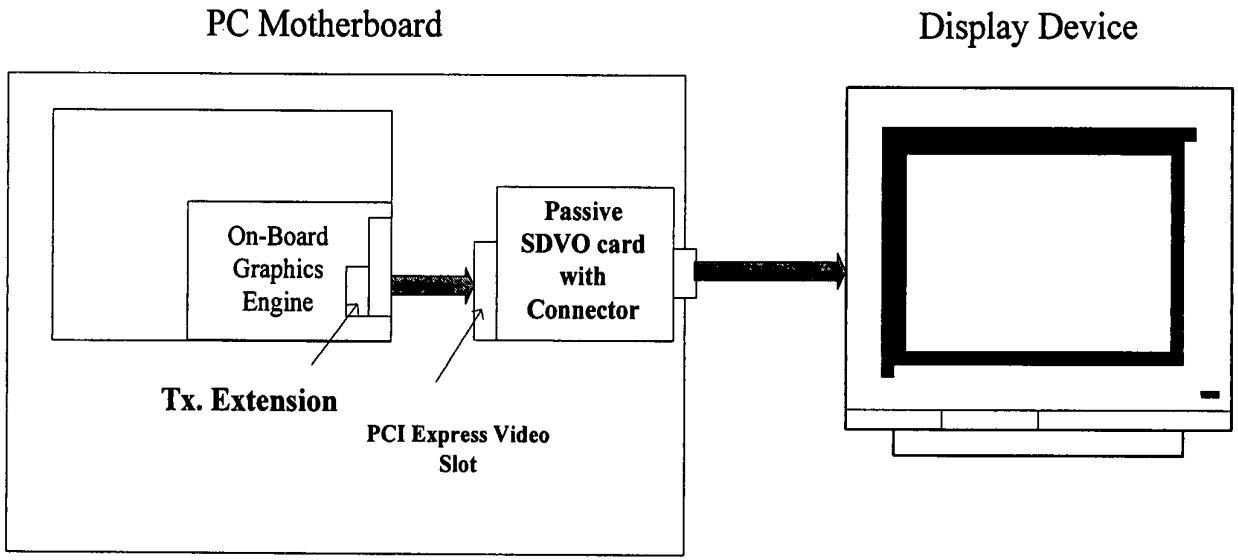

+12V
present
1902
Off
1904
Standby
No Activity on
Aux.Ch.& Main Link
Hot-plug
detect
activity
detected
Main Link
Training
Pass
1910
Normal Operation
No Activity on
Aux.Ch.
1906
1908
Sync-Loss
Event
1906/1908 - Link Discovery/Initialization

Fig. 19



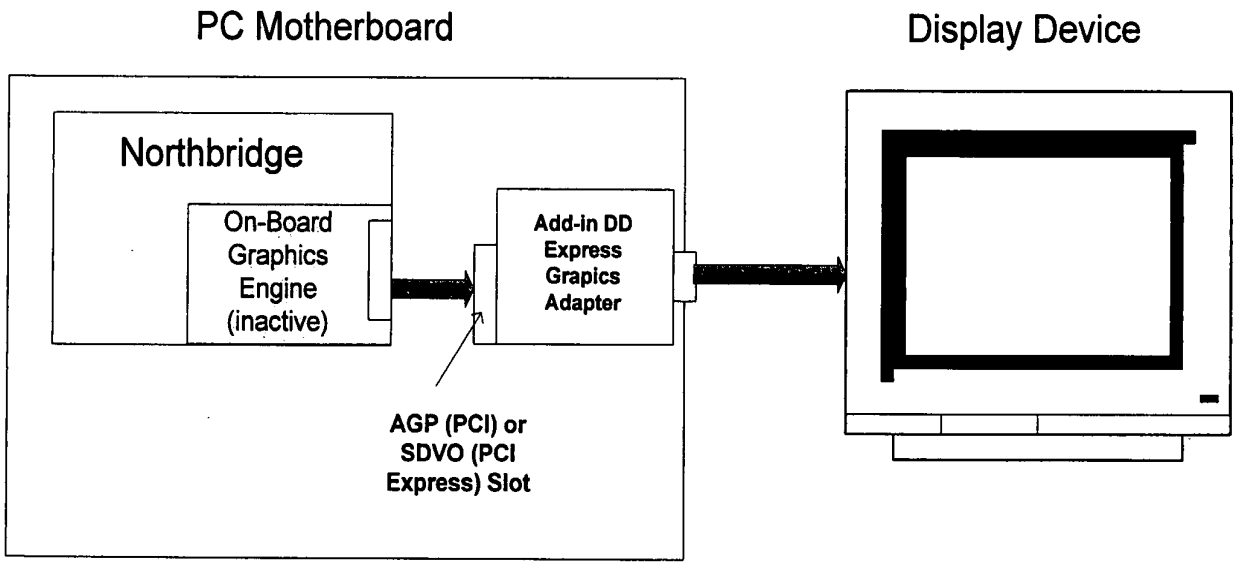
PCI EXPRESS MOTHERBOARD WITH DEDICATED DD-EXPRESS CONNECTOR

Fig. 20



PCI Express motherboard with passive connector card.

Fig. 21



PCI Express motherboard with add-in DD-Express graphics card

Fig. 22

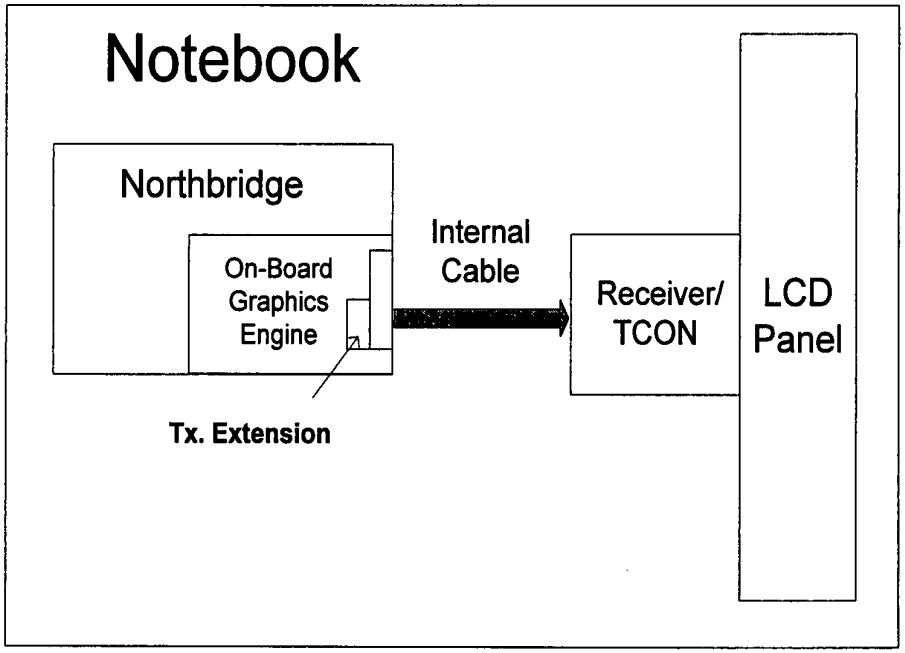
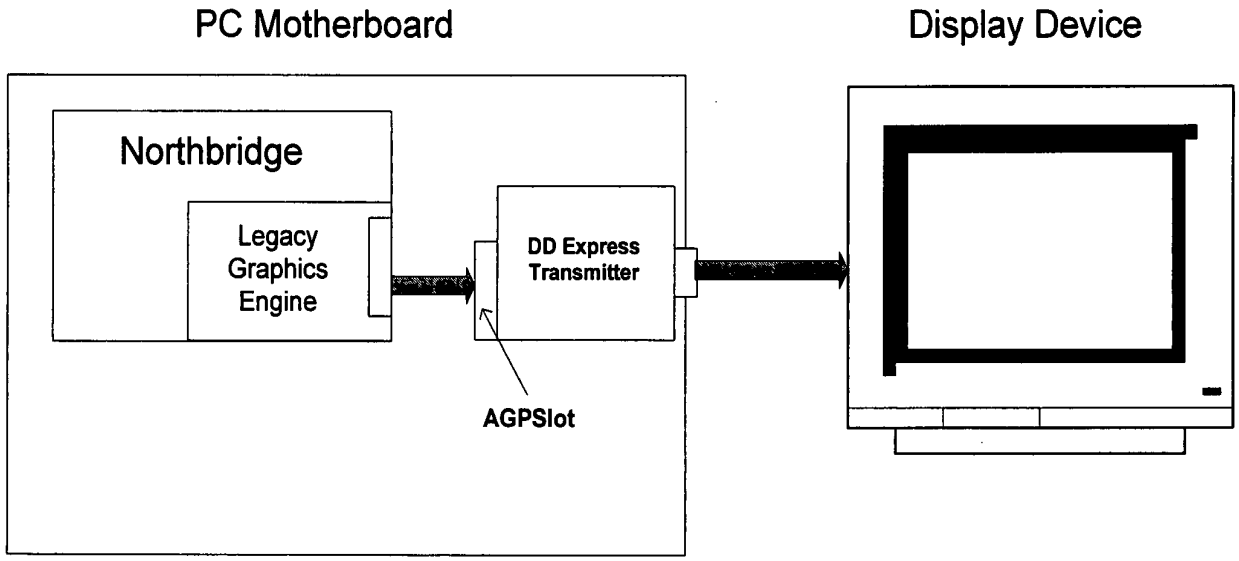

Notebook
Northbridge
On-Board
Graphics
Engine
Tx. Extension
Internal
Cable
Receiver/
TCON
LCD
Panel

Fig. 23



Legacy graphics accelerator bus transmitter mounted on a legacy bus card slot converts digital raster data/timing signals into main link streams

Fig. 24

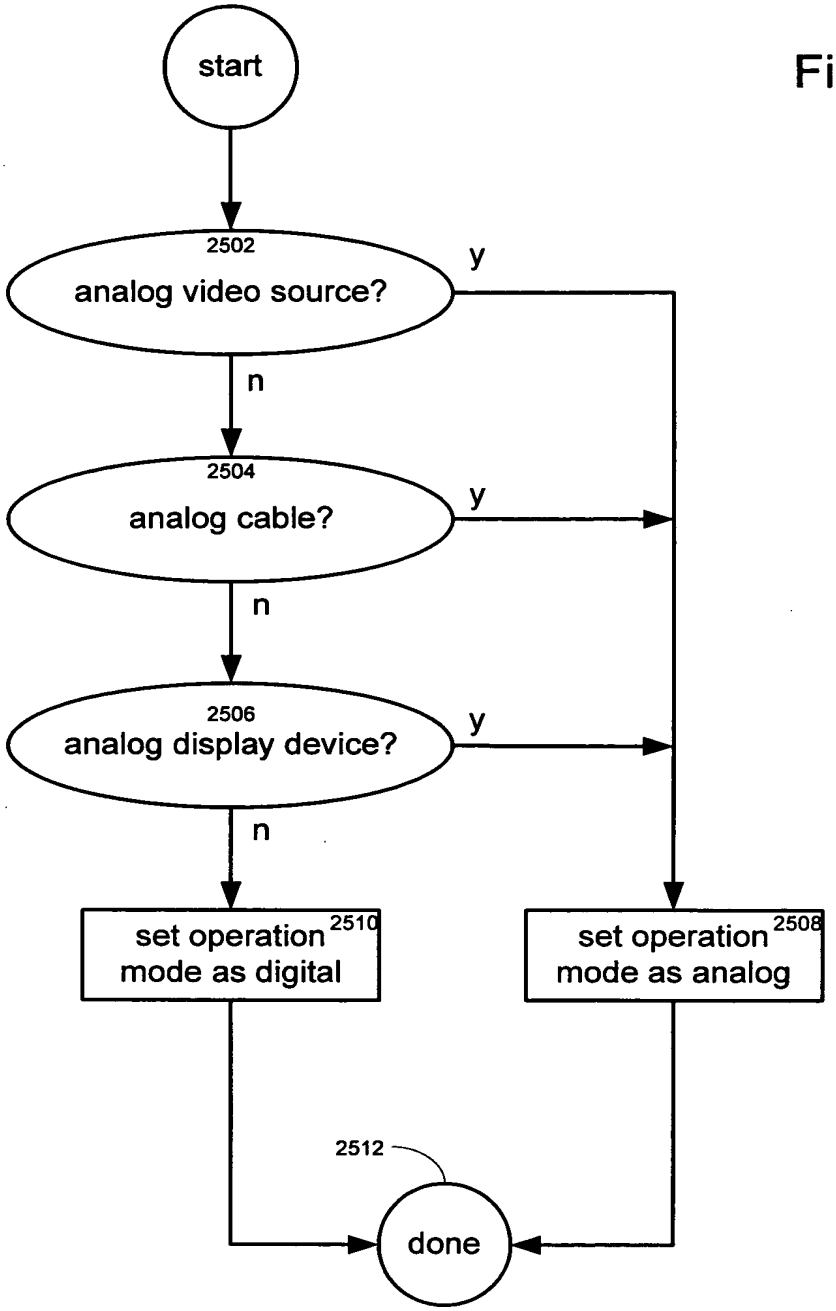

start
2502
analog video source?
y
n
2504
analog cable?
y
n
2506
analog display device?
y
n
set operation mode as digital
2510
set operation mode as analog
2508
2512
done

Fig. 25

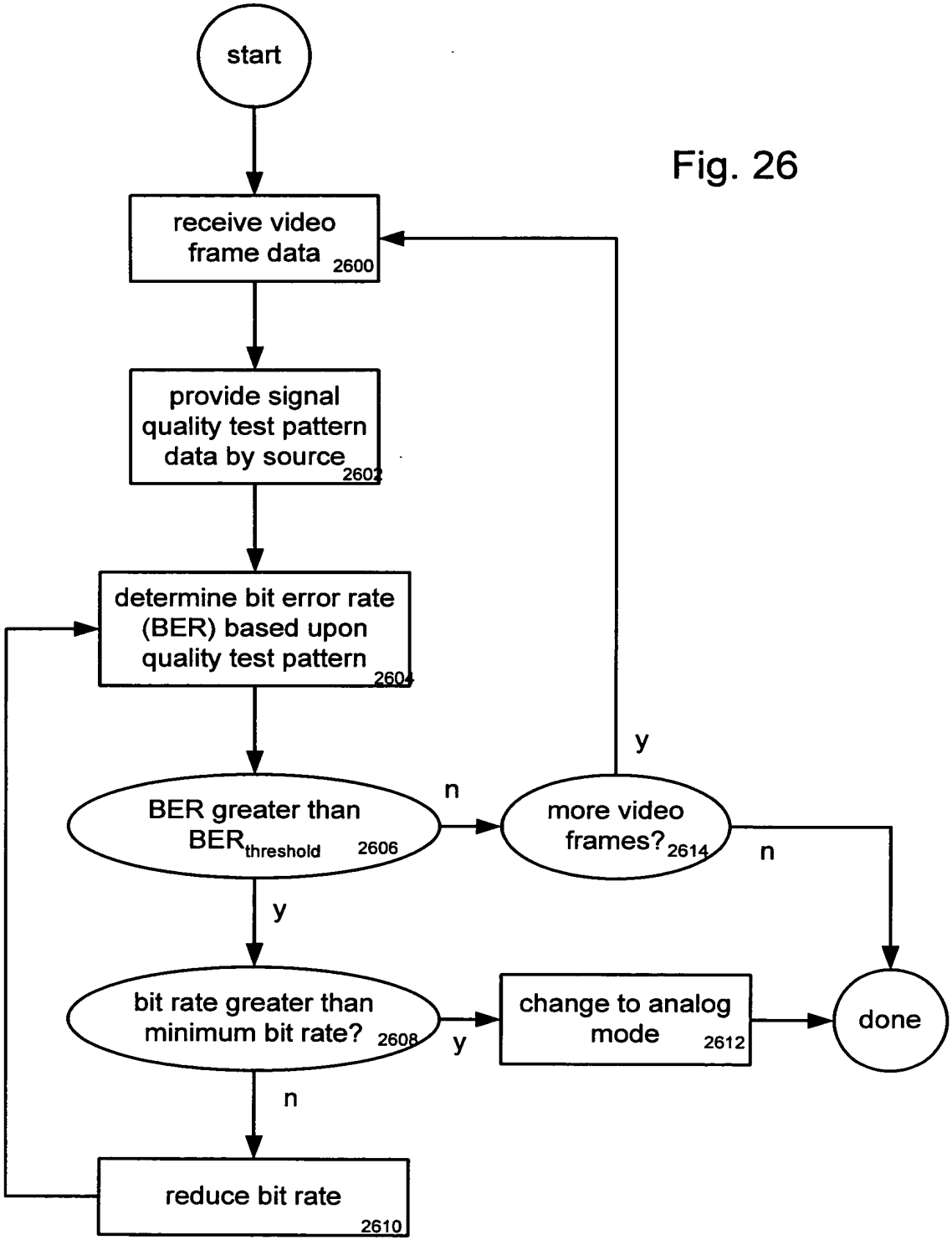

start
receive video frame data 2600
provide signal quality test pattern data by source 2602
determine bit error rate (BER) based upon quality test pattern 2604
BER greater than BER threshold 2606
n
more video frames? 2614
y
n
y
bit rate greater than minimum bit rate? 2608
y
change to analog mode 2612
done
n
reduce bit rate 2610

Fig. 26

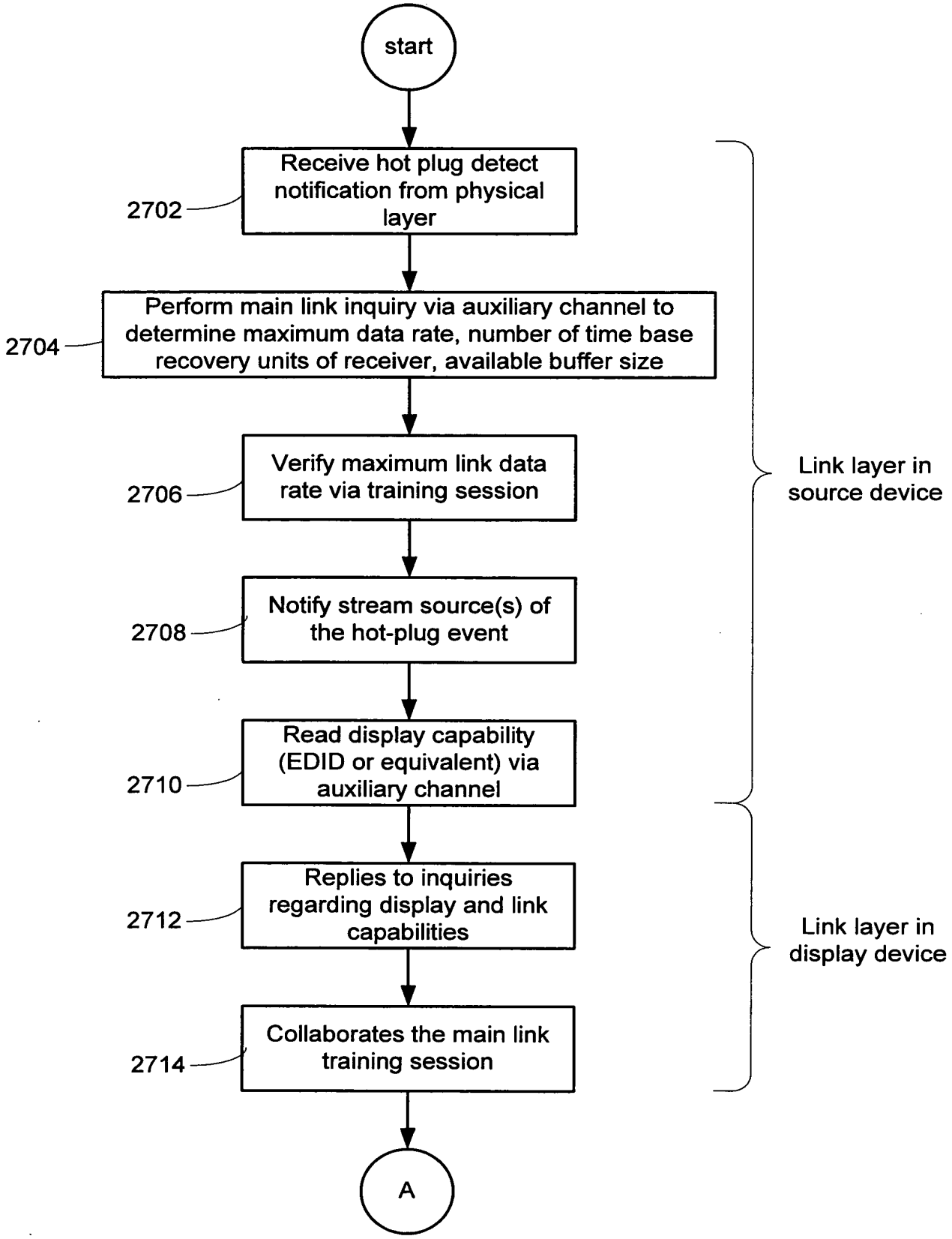

start
Receive hot plug detect notification from physical layer
2702
Perform main link inquiry via auxiliary channel to determine maximum data rate, number of time base recovery units of receiver, available buffer size
2704
Verify maximum link data rate via training session
2706
Notify stream source(s) of the hot-plug event
2708
Read display capability (EDID or equivalent) via auxiliary channel
2710
Replies to inquiries regarding display and link capabilities
2712
Collaborates the main link training session
2714
A
Link layer in source device
Link layer in display device

Fig. 27A

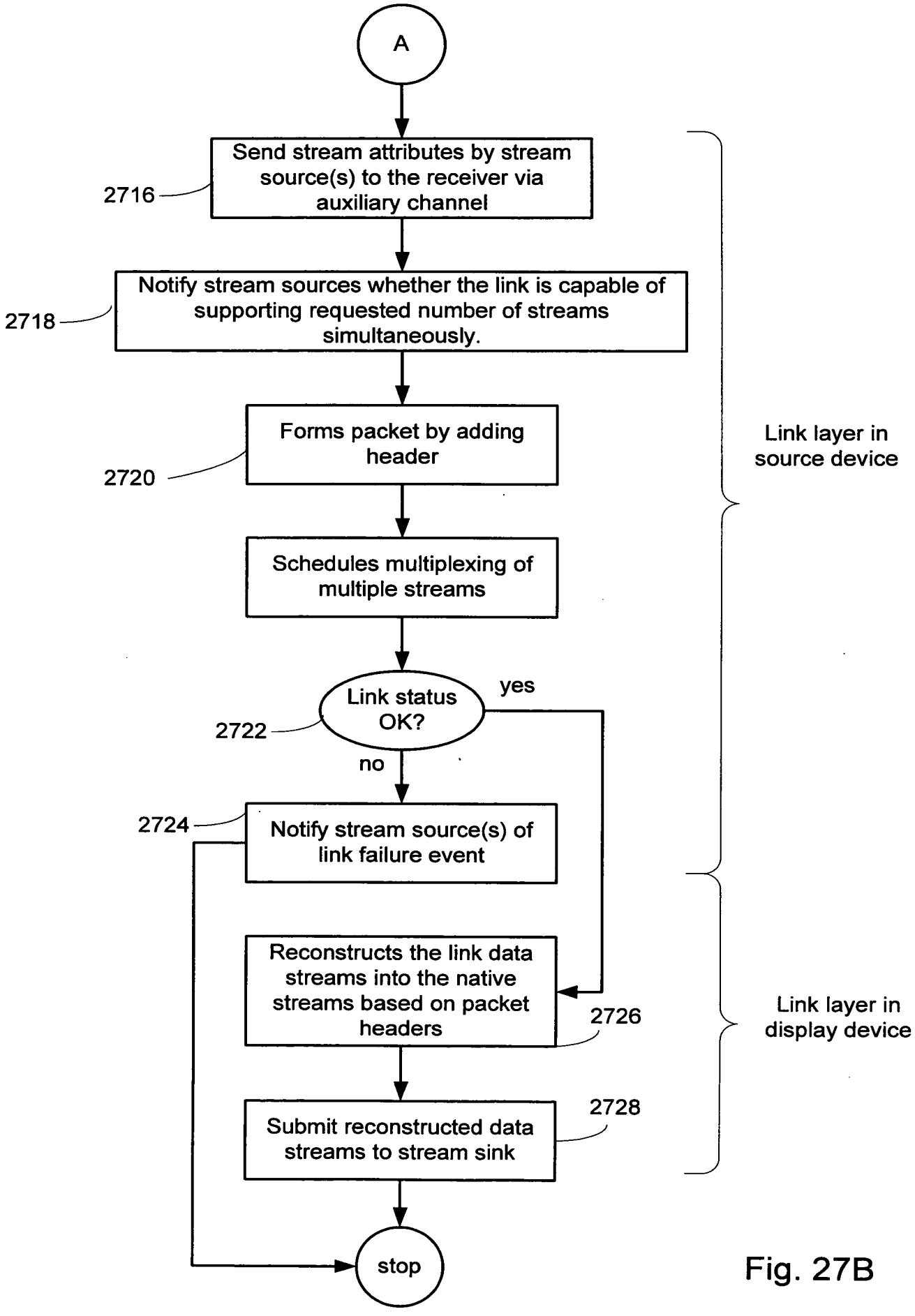

A
Send stream attributes by stream source(s) to the receiver via auxiliary channel
2716
Notify stream sources whether the link is capable of supporting requested number of streams simultaneously.
2718
Forms packet by adding header
2720
Schedules multiplexing of multiple streams
Link status OK?
2722
yes
no
Notify stream source(s) of link failure event
2724
Reconstructs the link data streams into the native streams based on packet headers
2726
Submit reconstructed data streams to stream sink
2728
stop
Link layer in source device
Link layer in display device

Fig. 27B

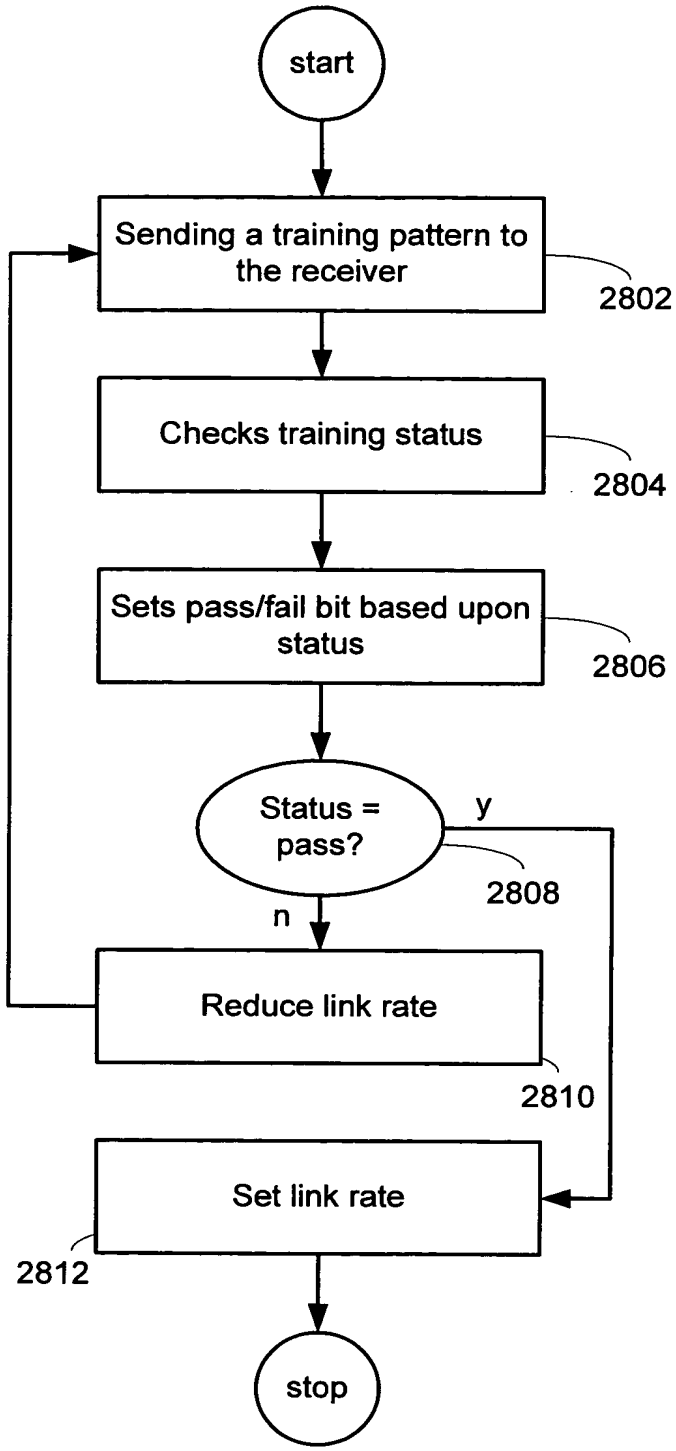

start
Sending a training pattern to the receiver
2802
Checks training status
2804
Sets pass/fail bit based upon status
2806
Status = pass?
y
2808
n
Reduce link rate
2810
Set link rate
2812
stop

Fig. 28

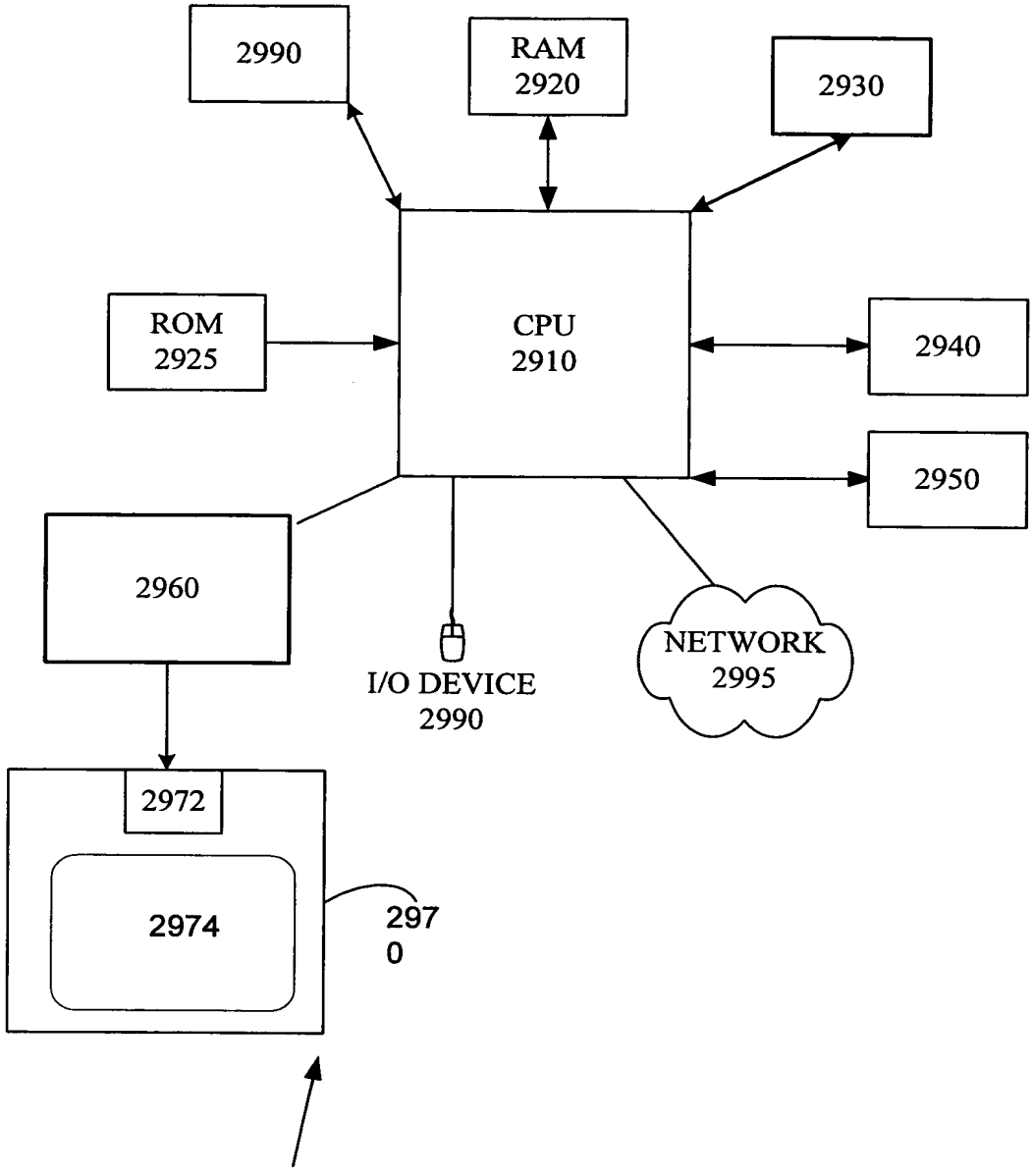

2990
RAM
2920
2930
ROM
2925
CPU
2910
2940
2950
2960
I/O DEVICE
2990
NETWORK
2995
2972
2974
297
0
2900

Fig. 29